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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/561,770	Applicant(s) OMORI ET AL.	
	Examiner Richard Edgar	Art Unit 3745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 October 2009 under 37 CFR 1.111.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17,30-39 and 41-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17,30-39 and 41-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input checked="" type="checkbox"/> Other: <u>37 CFR 1.105 requirement</u> . |

Requirement for Information

Applicant and the assignee of this application are required under 37 CFR 1.105 to provide the following information that the examiner has determined is reasonably necessary to the examination of this application.

In response to this requirement, please provide answers to each of the following interrogatories eliciting factual information:

- (1) What is the newly claimed "outer curved surface?"
- (2) Is it clear that Chou fails to teach or suggest asperities beyond the fifty percent chord length? Why?
- (3) Why would fifty percent necessarily distinguish "outer" from "inner," *per se*?
- (4) Regarding Applicants newly claimed limitation: "outer curved surface," why doesn't the FIG. 3b species of the JP 2002-168194 A teach a turbulence generating means on the outer surface of its blade, or does it?

This requirement is an attachment of the enclosed Office action. A complete reply to the enclosed Office action must include a complete reply to this requirement. The time period for reply to this requirement coincides with the time period for reply to the enclosed Office action.

Response to Amendment

For claim 1, Applicants have broadened the claim by removing the indefinite "bellmouth-like" in describing the casing inlet. New claim 43 has required the inlet to be a bellmouth. Because Applicants have broadened claim 1 and also added claim 43, a supplemental oath/declaration is required under 37 CFR 1.67 because the subject matter is not substantially embraced in the claims originally presented. See 37 CFR §1.67(b).

Next, in claim 1, Applicants have removed the asperities being on "at least on side of dorsal and ventral sides" and instead required the asperities to be on "an outer curved surface." Applicants cite FIG. 2 for showing "asperities 6 are located along the outer curve of the fan blade." Applicants then assert "Chou's asperities are not on an outer curved surface of Chou's blades." Thus, Applicant's believe claim 1 is now patentable. The examiner disagrees.

First, it is unclear what Applicants are now claiming. What is the newly claimed "outer curved surface?" Chou teaches that the trip, or asperities "should be located on pressure surface 14 at a point that is about five to fifty percent of the blade chord length from leading edge" (col. 2, lines 58-61). Is it clear that Chou fails to teach or suggest asperities beyond the fifty percent chord length? Why would fifty percent necessarily distinguish "outer" from "inner," *per se*? Perhaps Applicants are not even claiming the relative chordial length, but rather are deeming the dorsal side 2 to be the newly claimed "outer curved surface." The examiner is uncertain what the amended claims are encompassing.

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Besides, Chou fails to teach away from extending the asperities beyond the fifty percent chord length of the blade. An asperity adjacent the leading edge reduces the boundary layer separation (see FIG. 3A, 3B). One skilled in the art would appreciate the separation of the boundary layer is possible along the entire chordial length of the centrifugal blade. The references JP 2001-32794 and JP 7-4388 each teaches turbulence generating means beyond the fifty percent chord of the centrifugal fan blade.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-17, 30-39 and 41-43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants newly claim the plurality of asperities being on “an outer curved surface,” but fail to disclose what the outer curved surface is, and/or where it begins.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3, 9-11, 13-14, 16, 41, 42 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' admitted prior art in view of United States Patent No. 5,169,290 (Chou hereinafter), and further in view of any one of JP 7-4388, JP 11-294386 and JP 2001-32794.

For claim 1, Applicants' admit as prior art, FIG. 15-20 showing a "conventional centrifugal fan used for a ventilating blower and air conditioner" (page 1, lines 12-13);

the fan comprising: a plurality of blades 1110 circularly arranged, wherein the plurality of blades are interposed between a ring-like lateral plate 1105 and a main plate 1107, and integrated;

a casing 1104 including therein the plurality of blades, wherein the casing has a discharge outlet 1103, and a bellmouth-like inlet 1101 with an internal diameter equal to that of the plurality of blades circularly arranged (page 2, lines 1-4); and

a motor 1112 with a rotation axis 1113 thereof connected to the main plate 1107, wherein the motor is fixed to the casing (page 2, lines 12-13);

a side of the lateral plate 1105 of the plurality of blades is arranged at the inlet.

For claim 2, the main plate 1107 has a substantially truncated-cone-shaped throttle 1106 projecting toward the lateral plate 1105 (see page 2, lines 4-7).

For claim 3, the inside of the casing 1104 is formed spirally (see page 2, line 1).

For claim 19, the centrifugal fan is used in a ventilating blower or an air conditioner (see page 1, lines 12-13).

The admitted prior art fails to show asperities on an outer curved surface thereof, the asperities formed with a projection and a recess alternately repeated from a front edge toward a rear edge thereof in cross section vertical to a rotation axis of the plurality of blades.

Chou teaches a plurality of asperities 21a (FIG. 4A) on at least one side of the dorsal and ventral sides of a centrifugal fan blade 14a, the asperities formed with a projection and recess alternately repeated from a front edge toward a rear edge thereof, "at a point that is about five to fifty percent of the blade chord length from the leading edge" (col. 2, lines 58-61) in cross section vertical to a rotation axis of the plurality of

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blades (col. 3, lines 1-3) for the purpose of delaying boundary layer separation. The Chou fan is the type used in HVAC systems (see col. 1, lines 35-36). In one embodiment of Chou (FIG. 4A), the shape of the asperities 21a are triangular, as are the recesses, both being repeated. The claimed range: $D1 < 2X < D1 + 0.35(D2-D1)$ in claims 14 and 16 (and further in claims 37 and 39) provides no patentable difference over the claimed 5-50% teaching of Chou as the ranges inherently overlap and this a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

As the admitted prior art centrifugal fan and the Chou centrifugal fan are both HVAC centrifugal fans, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the blades of the admitted prior art centrifugal fan to have the Chou asperities thereon for the purpose of delaying boundary layer separation, and improving performance of the fan.

Regarding the newly claimed asperities being on “an outer curved surface,” assuming *arguendo*, Chou fails to teach this indefinite limitation, each of JP 7-4388, JP 11-294386 and JP 2001-32794 clearly teach surface turbulators on radially outer surfaces of the centrifugal blades. Accordingly, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to extend the asperities of Chou to be on the radially outer surface of the blades for the purpose of

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disrupting the laminar flow and delaying boundary layer separation on the radially outer surfaces of the blades.

Claims 4-5, 31-33, 35, 37 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' admitted prior art in view of United States Patent No. 5,169,290 (Chou hereinafter), and further in view of any one of JP 7-4388, JP 11-294386 and JP 2001-32794, as applied to claim 1 above, and further in view of United States Patent No. 4,647,271 (Nagai et al. hereinafter).

The modification of Applicants' admitted prior art with the Chou reference is previously explained above. A linearly tapering blade width along the axial direction is not discussed by Applicants' nor in the Chou reference.

Nagai et al. disclose a centrifugal fan for an air conditioning system (col. 1, lines 6-10) comprising blades 3 having an internal diameter (D_{IH} , D_{IS}) increasing from a main plate 4 to the lateral plate 2 for the purpose of reducing fan noise. FIG. 1 shows a linear tilt.

Since the modified admitted prior art and Chou is an air conditioning fan, and Nagai et al. teach to taper the blades to reduce noise, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to further modify Applicants' admitted prior art such that the blades are tapered as taught by Nagai et al. for the purpose of reducing the noise produced by the fan.

Claims 40 and 41 are believed to have improper dependency based on at least the preamble in claim 40, as well as the failure of claim 40 to further limit claim 4.

Claims 6-8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' admitted prior art in view of United States Patent No. 5,169,290 (Chou hereinafter), and further in view of any one of JP 7-4388, JP 11-294386 and JP 2001-32794 as applied to claim 1 above.

The modification of Applicants' admitted prior art with the Chou reference and any one of the JP references is previously explained above. Chou teaches expressly four species in FIG. 4A-D of different shaped asperities. Continuously repeated arc-shaped recesses and projections, and continuously repeated quadrangles are not expressly disclosed. Chou teaches "other configurations are possible" (col. 3, line 1) after describing the species of FIG. 4A-D.

At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to change the shape of the triangular species of FIG. 4A of Chou to be arcs or quadrangles as a matter of choice, absent persuasive evidence that the particular configuration of the claimed blade is significant. *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Claims 1 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Application Publication Laid-open No. 2002-168194 A in view of United States Patent No. 5,169,290 (Chou hereinafter).

Applicants have equated the previously applied Applicants' admitted prior art to the Japanese Patent Application Publication Laid-open No. 2002-168194 A document

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on page 1, lines 12-14. Fig. 3b is not discussed in Applicants' disclosure, but a translated document evidences the direction of incline equivalent to Applicants' FIG. 5B species: "the swelling 11b inclines so that it sees in the shaft direction of an impeller, and the maximum position of the swelling 11b in a section vertical to the axis of rotation of said impeller 2 is close to the primary plate 6 and it may serve as trailing edge 18 slippage of the wings 5b." Accordingly, since Chou teaches the plural asperities on the fan blades, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the inclined swelling 11b of the FIG. 3 species of the Japanese Patent Application Publication Laid-open No. 2002-168194 A to be the plural asperities as taught by Chou for the purpose of delaying the onset of boundary layer separation.

Regarding Applicants newly claimed limitation, why isn't the FIG. 3b species of the JP 2002-168194 A teach a turbulence generating means on the outer surface of the blade?

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Application Publication Laid-open No. 2002-168194 A in view of United States Patent No. 5,169,290 (Chou hereinafter) as applied to claims 1 and 15 immediately above, and further in view of United States Patent No. 4,647,271 (Nagai et al. hereinafter).

Applicants have equated the previously applied Applicants' admitted prior art to the Japanese Patent Application Publication Laid-open No. 2002-168194 A document

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on page 1, lines 12-14. Fig. 3b is not discussed in Applicants' disclosure, but a translated document evidences the direction of incline equivalent to Applicants' FIG. 5B species: "the swelling 11b inclines so that it sees in the shaft direction of an impeller, and the maximum position of the swelling 11b in a section vertical to the axis of rotation of said impeller 2 is close to the primary plate 6 and it may serve as trailing edge 18 slippage of the wings 5b." Accordingly, since Chou teaches the plural asperities on the fan blades, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the inclined swelling 11b of the FIG. 3 species of the Japanese Patent Application Publication Laid-open No. 2002-168194 A to be the plural asperities as taught by Chou for the purpose of delaying the onset of boundary layer separation.

Nagai et al. disclose a centrifugal fan for an air conditioning system (col. 1, lines 6-10) comprising blades 3 having an internal diameter (D_{IH} , D_{IS}) increasing from a main plate 4 to the lateral plate 2 for the purpose of reducing fan noise.

Since the Japanese Patent Application Publication Laid-open No. 2002-168194 A document and Chou are air conditioning fans, and Nagai et al. teach to taper the blades to reduce noise, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to further modify the Japanese Patent Application Publication Laid-open No. 2002-168194 A document such that the blades are tapered as taught by Nagai et al. for the purpose of reducing the noise produced by the fan.

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Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' admitted prior art in view of United States Patent No. 5,169,290 (Chou hereinafter), and further in view of any one of JP 7-4388, JP 11-294386 and JP 2001-32794 as applied to claim 1 above.

Claim 17 recites relative dimensional ranges between the asperities' depth and blade thickness; the asperities' width to the depth; and the height of the asperities to the height of the blade. The ranges recited are each broad. The specification provides no evidence of unexpected results to render the combination of claimed ranges unobvious. There are even no particular examples provided that are deemed optimum. Rather, Applicants merely claim the numerical range limitations without any teaching of the significance of the range boundaries. Accordingly, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to make the asperities of the modified admitted prior art by Chou to have an asperity depth to blade thickness within a 0.1 to 0.7 range, further have a ratio between the asperity width to the depth to be within a 0.5 and 2.5 range, and yet further have the ratio of the length of the asperities from the lateral plate towards the main plate to the height of the blades be within a 0.1 to 1.0 range, because each and all of the ranges are sufficiently broad, and a person having ordinary skill in the art would under normal experimentation, optimize the shape and dimensions of the asperities based on operating conditions of the fan for the purpose of increasing the efficiency of the fan.

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Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' admitted prior art in view of United States Patent No. 5,169,290 (Chou hereinafter), and further in view of any one of JP 7-4388, JP 11-294386 and JP 2001-32794 as applied to claim 17 immediately above, and further in view of United States Patent No. 4,647,271 (Nagai et al. hereinafter).

Claim 38 recites relative dimensional ranges between the asperities' depth and blade thickness; the asperities' width to the depth; and the height of the asperities to the height of the blade. The ranges recited are each broad. The specification provides no evidence of unexpected results to render the combination of claimed ranges unobvious. There are even no particular examples provided that are deemed optimum. Rather, Applicants merely claim the numerical range limitations without any teaching of the significance of the range boundaries. Accordingly, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to make the asperities of the modified admitted prior art by Chou to have an asperity depth to blade thickness within a 0.1 to 0.7 range, further have a ratio between the asperity width to the depth to be within a 0.5 and 2.5 range, and yet further have the ratio of the length of the asperities from the lateral plate towards the main plate to the height of the blades be within a 0.1 to 1.0 range, because each and all of the ranges are sufficiently broad, and a person having ordinary skill in the art would under normal experimentation, optimize the shape and dimensions of the asperities based on operating conditions of the fan for the purpose of increasing the efficiency of the fan.

Nagai et al. disclose a centrifugal fan for an air conditioning system (col. 1, lines 6-10) comprising blades 3 having an internal diameter (D_{IH} , D_{IS}) increasing from a main plate 4 to the lateral plate 2 for the purpose of reducing fan noise.

Since Applicants' admitted prior art and Chou are air conditioning fans, and Nagai et al. teach to taper the blades to reduce noise, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to further modify Applicants' admitted prior art such that the blades are tapered as taught by Nagai et al. for the purpose of reducing the noise produced by the fan.

Claims 30 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' admitted prior art in view of United States Patent No. 5,169,290 (Chou hereinafter), and further in view of any one of JP 7-4388, JP 11-294386 and JP 2001-32794 and further in view of United States Patent No. 4,647,271 (Nagai et al. hereinafter), as applied to claim 4 above.

The modification of Applicants' admitted prior art with the Chou and Nagai et al. references is previously explained above. Chou teaches expressly four species in FIG. 4A-D of different shaped asperities. Continuously repeated arc-shaped recesses and projections, and continuously repeated quadrangles are not expressly disclosed. Chou teaches "other configurations are possible" (col. 3, line 1) after describing the species of FIG. 4A-D.

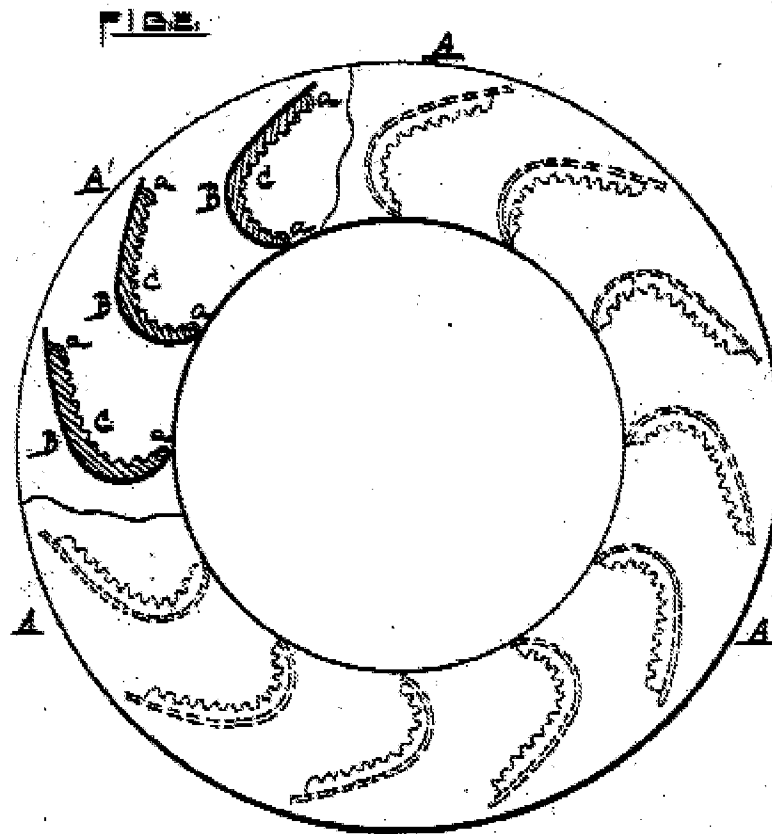
At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to change the shape of the triangular species of FIG. 4A

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of Chou to be arcs or quadrangles as a matter of choice, absent persuasive evidence that the particular configuration of the claimed blade is significant. *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Newly Cited Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent No. 465,439 teaches a centrifugally shaped impeller having an entire curved surface of the blades (B) formed with asperities (C). See copy of FIG. 2 below:



Conclusion

This Office action has an attached requirement for information under 37 CFR 1.105. A complete reply to this Office action must include a complete reply to the attached requirement for information. The time period for reply to the attached requirement coincides with the time period for reply to this Office action.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard Edgar whose telephone number is (571) 272-4816. The examiner can normally be reached on Monday thru Friday, 7 am- 5 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Richard Edgar/
Primary Examiner, Art Unit 3745